



*Creating Solutions.
Inspiring Action.*

Strengthening the STEM Education & Workforce Pipeline: Insights from the BHEF U.S. STEM Education Model Led to the STEM Higher Education and Workforce Project

**Naval STEM Forum
June 15, 2011**

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 15 JUN 2011	2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011		
4. TITLE AND SUBTITLE Strengthening The STEM Education & Workforce Pipeline: Insights From The BHEF U.S. STEM Education Model Led To The STEM Higher Education And Workforce Project			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Business-Higher Education Forum,Washington,DC,20036			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at 2011 Naval Stem Forum, June 15, 2011, Arlington Virginia,Government or Federal Purpose Rights License					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 14	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

BHEF's STEM Initiative

Seeks to answer these questions:

- Could we double the number of college graduates in the STEM disciplines in 10 years?
- What would be the highest leverage strategies to achieve this goal?

The BHEF U.S. STEM Education Model

- Developed by Raytheon and donated to BHEF in 2009
 - Now managed by BHEF-Ohio State-Raytheon partnership
- Available through www.bhef.com Web version at:
<http://forio.com/simulate/bhef/u-s-stem-education-model/overview/>

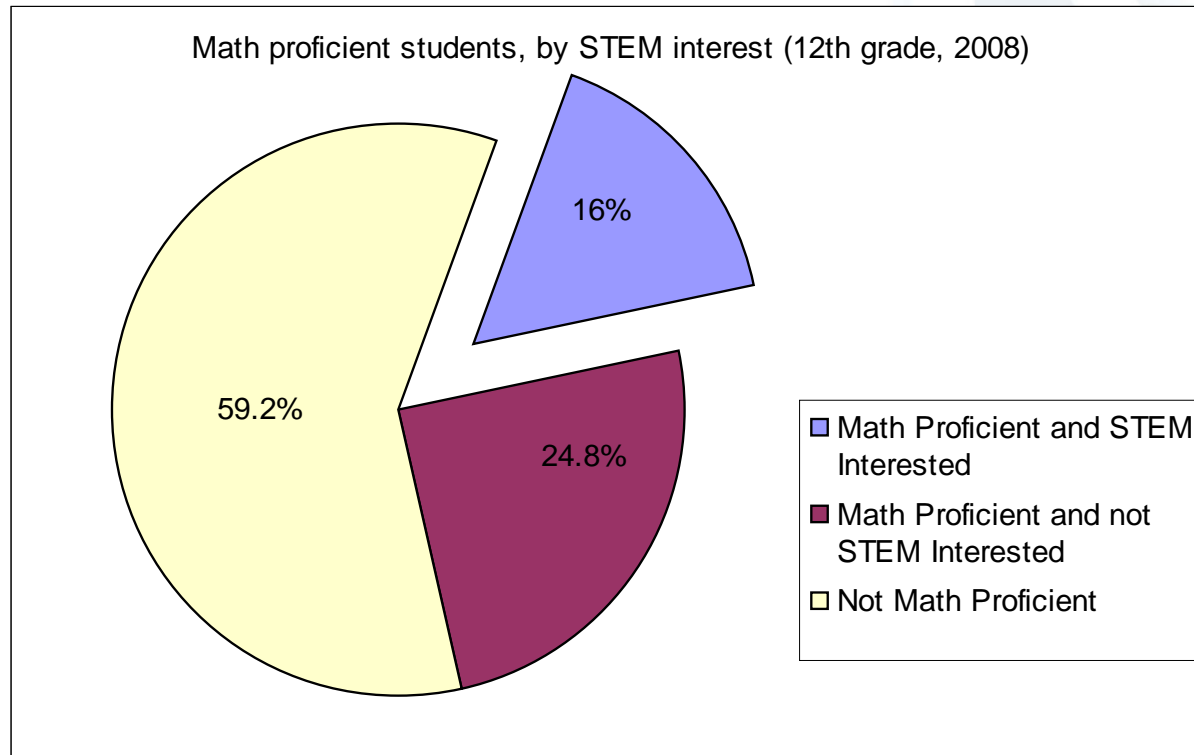
Doubling the Number: Insights from the Model

- **Neither K-12 strategies nor higher education strategies alone** are likely to achieve this aim
- **STEM-capable K-12 teachers are vital** to increasing the pool of likely STEM majors
- **Interest in STEM and proficiency in math are key and independent determinants** of choosing STEM major/career
- **Strengthening undergraduate education** yields an early and significant return on investment
- **Strategies and programs** have been proven to increase STEM persistence and deepen STEM learning

New ACT Longitudinal Data Sets

- National Data set tracks STEM interest and proficiency from 8th grade to into college majors by race, ethnicity, income and other characteristics
- Permits data analysis and modeling of subgroups
- Permits modeling of numerous policy alternatives
- BHEF has dozens of state data sets for modeling state policy

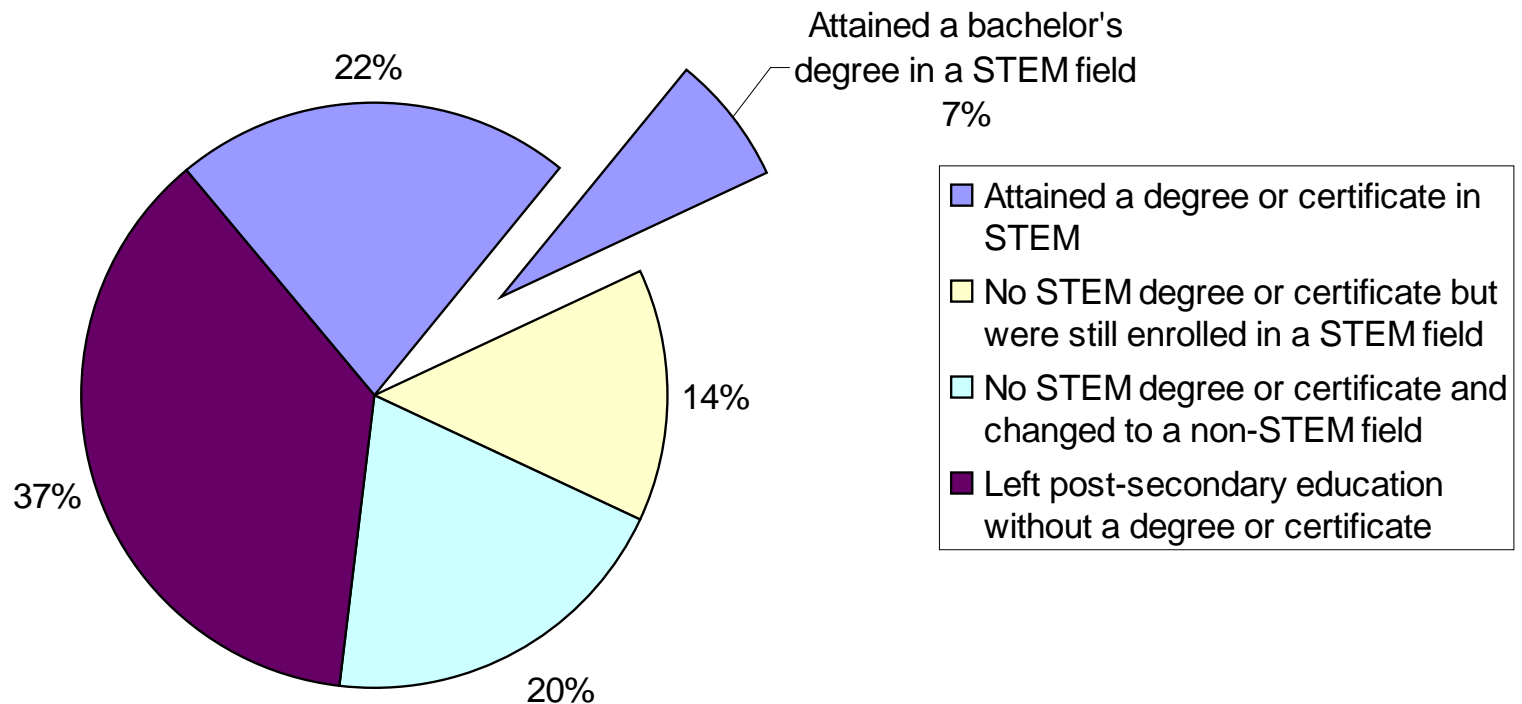
Low Levels of Interest in STEM and Proficiency in Math Among College-bound 12th Graders Results in Relatively Few Students Likely to Major in STEM or take STEM Courses



SOURCE: ACT. (2008). BHEF analysis of the EPAS Data provided by ACT.

STEM Degrees for Community College Students

2001 Degree Attainment and Persistence Among Students First Enrolled at Public 2-Year Institutions for STEM Entrants 1995-96

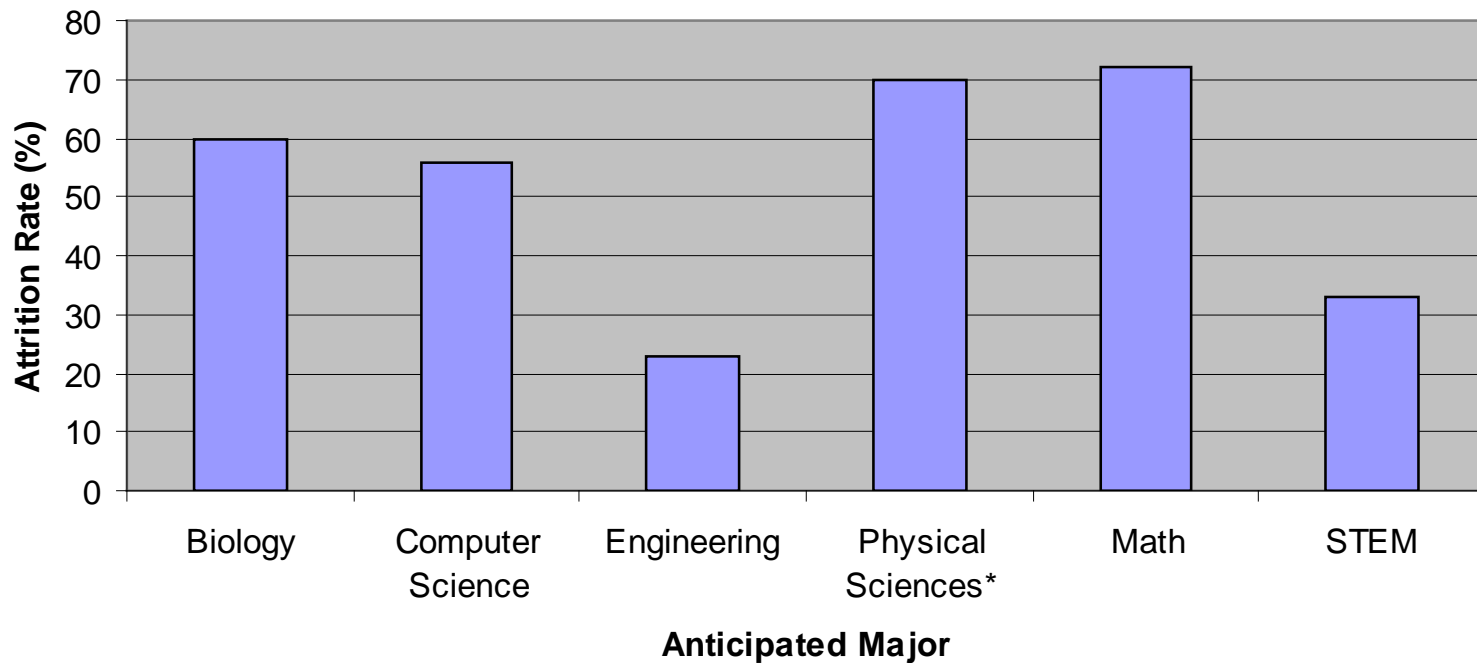


Source: Chen. X. (2009). *Students who study science, technology, engineering, and mathematics (STEM) in Postsecondary education*. National Center for Education Statistics, Institute of Education Sciences, Table 8.

Challenges to Strengthening STEM Undergraduate and Graduate Education

- Fewer than half of students who begin in STEM disciplines stay the **course**; most who change transfer to another major after first year; out migration most severe for women and minorities
- **Minority degree numbers dropping** or failing to keep pace, even among Asian-American students
- **Freshmen intending to major in S&E and engineering is flat, but decreasing among Blacks & Hispanics (2004-2008)****
- **Broken pathway from community colleges** to 4-year colleges in STEM—less than 10% of transfers are STEM majors in some systems; 7.3% graduate
- **Some bright spots**, however – aerospace and mechanical engineering degrees increased and Professional Science/Engineering Masters being adopted by corporations, e.g. UMBC Cyber Security Masters

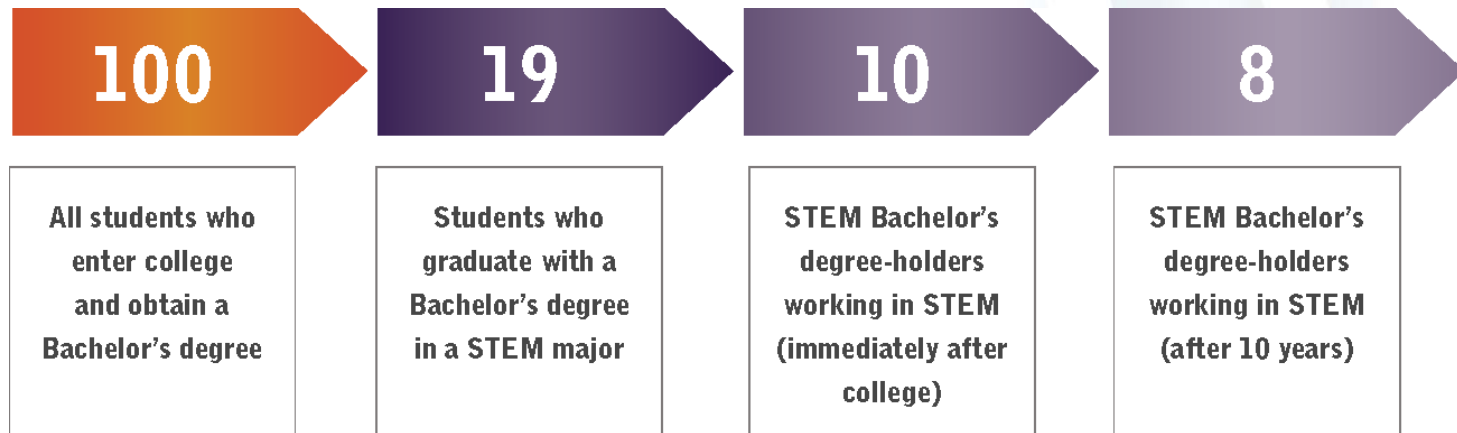
Undergraduate STEM Attrition by Major



*includes Chemistry, Physics, Earth and Planetary Sciences

Source: Koff, R., Molter, L., & Renninger, K.A. (2009). Why Students Leave STEM Fields: Development of a Common Data Template and Survey Tool. A report to the Alfred P. Sloan Foundation. 9

And only about half of STEM college graduates choose to work in STEM careers upon graduation



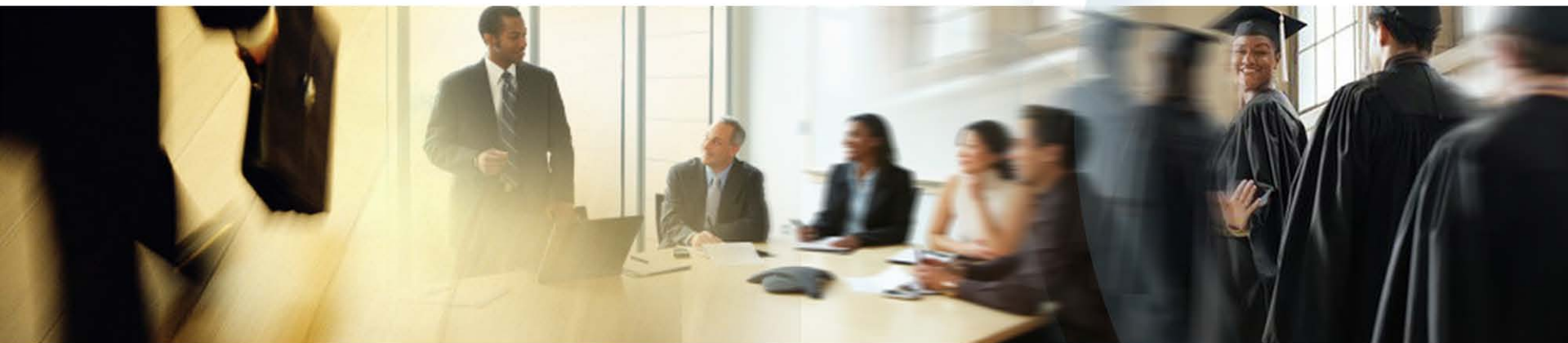
SOURCE: Carnevale, T. (2011). *The STEM Workforce*. Presentation to the PCAST Working Group on STEM Higher Education, April 15, 2011.

STEM Higher Education and Workforce Project: Focus on Persistence and Deepening Learning

- Led by Walt Havenstein (CEO, SAIC) and Mark Wrighton (Chancellor, Wash U)
- Data analysis and modeling;
- Research on institutional co-curricular programs, course improvement, student persistence and learning;
- Examination of external programs e.g., early internships and research that introduce freshmen and sophomores to STEM careers; and,
- An exploration of STEM skills that are essential to industry/gov.
- Pilot projects with BHEF members to improve STEM undergraduate and graduate education (MD, OH, WI)

UMD System Pilot Project to Boost STEM Grads by 40%

- Led by System Chancellor Brit Kirwan, UMD System will:
 - Conduct migration study for STEM disciplines
 - Address first-year attrition by adopting co-curricular program, e.g., freshman research program, cohort program
 - Restructure first-year STEM courses (based on Carl Wieman's principles)
 - Collaborate with business, (Raytheon, Northrop, SAIC, Battelle), and Gov. (ONR, NSA, NIH, NIST, NASA) around skills and STEM careers



*Creating Solutions.
Inspiring Action.*

Questions & Discussion

www.bhef.com

<http://forio.com/simulate/bhef/u-s-stem-education-model/overview/>